

Isis

Elegance, Beauty, and Comfort Under Sail



S.M. Doherty
K.A. Johnson
M.A.
Sammataro
S.G. Weber



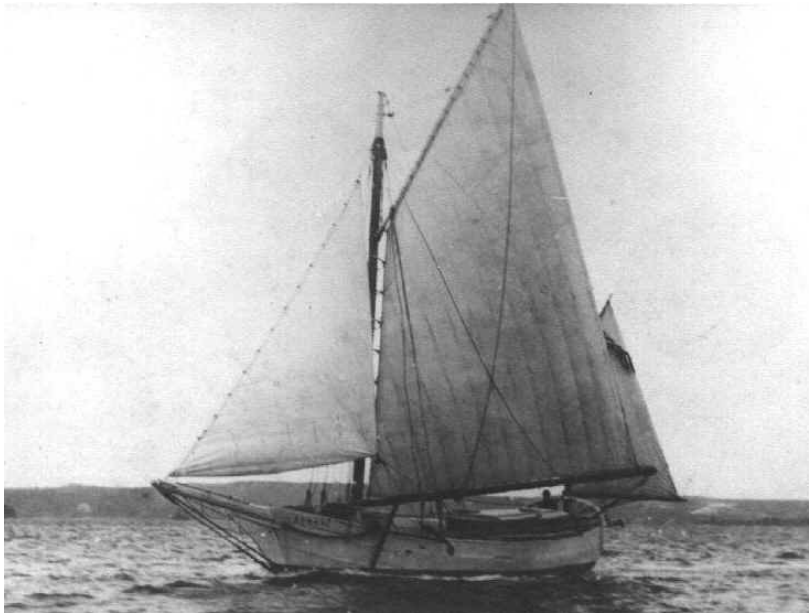
[Mission Statement

The *Isis* is a trans-oceanic sloop characterized by classic styling, while still utilizing modern technology. She is designed for the discerning owner who desires a high-performance yacht equally capable of providing a comfortable day sail with friends and family, impressing boat enthusiasts and business partners with its smooth lines and luxurious accommodations, or enduring a trans-Atlantic voyage for a vacation getaway.



[Parametric Analysis]

Looked at 57 vessels
between 57' and 112'



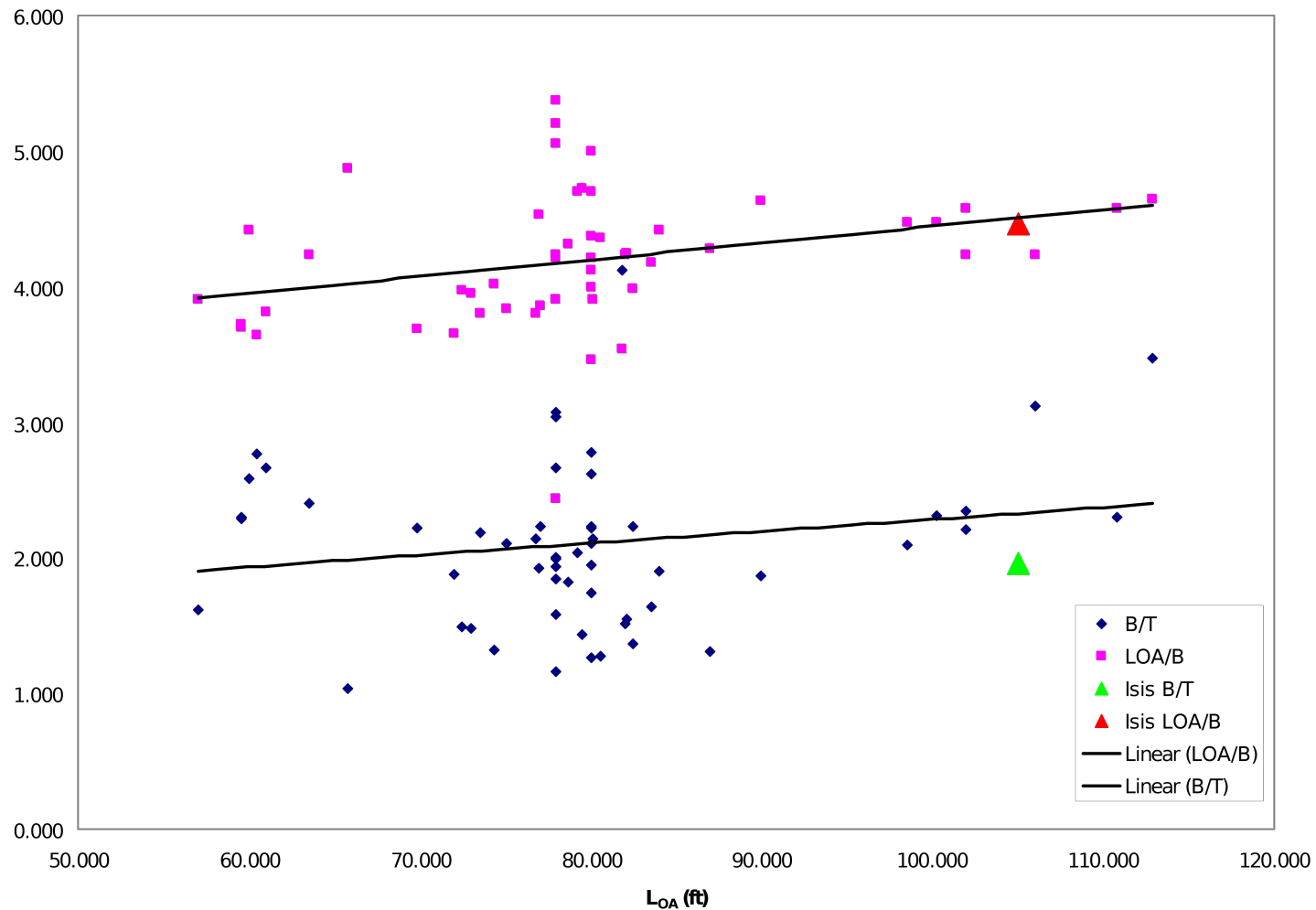
'Spray'



'Sayonara'



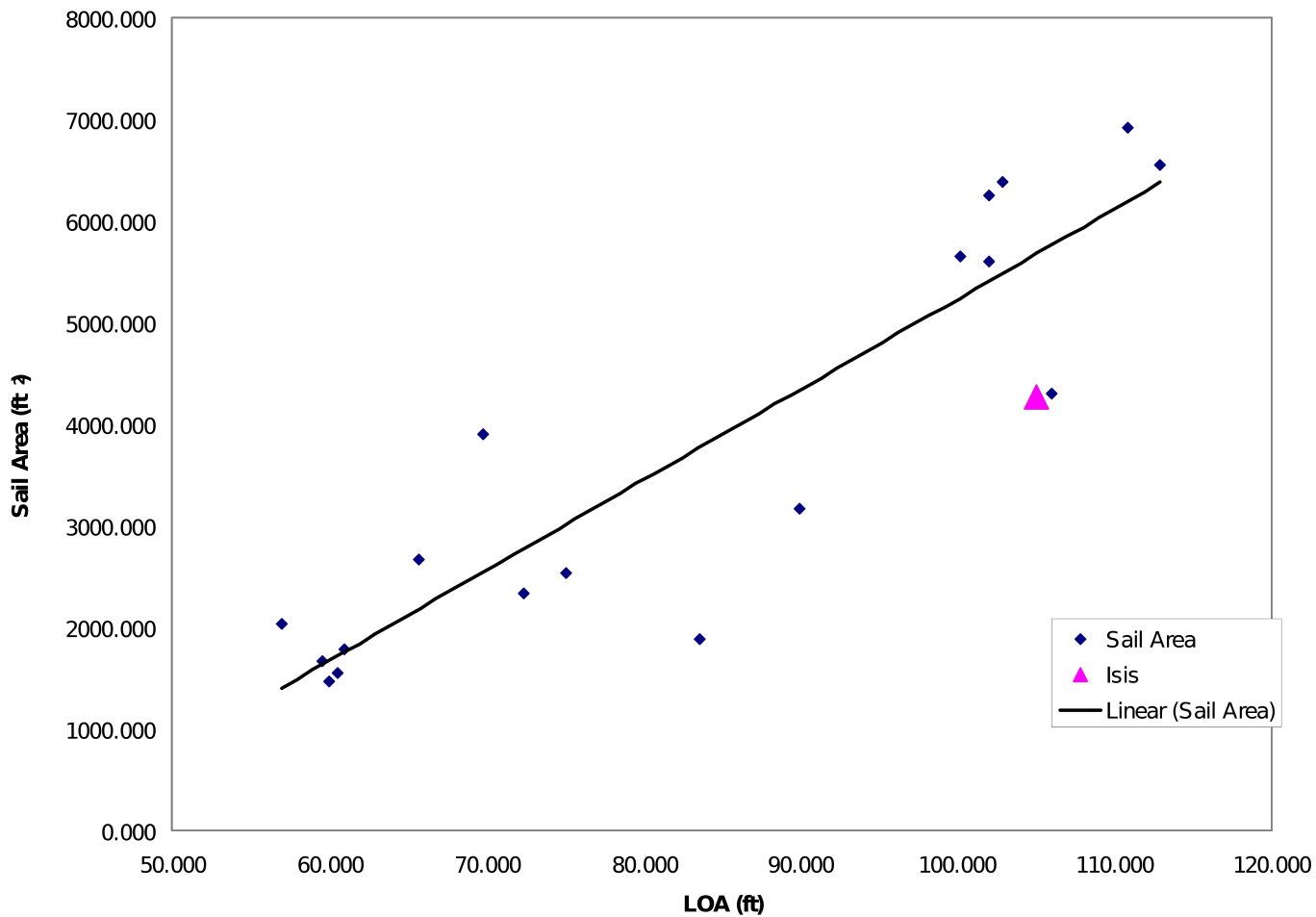
[Parametric Analysis]



[Parametric Analysis]



Sail Area vs. Length Overall



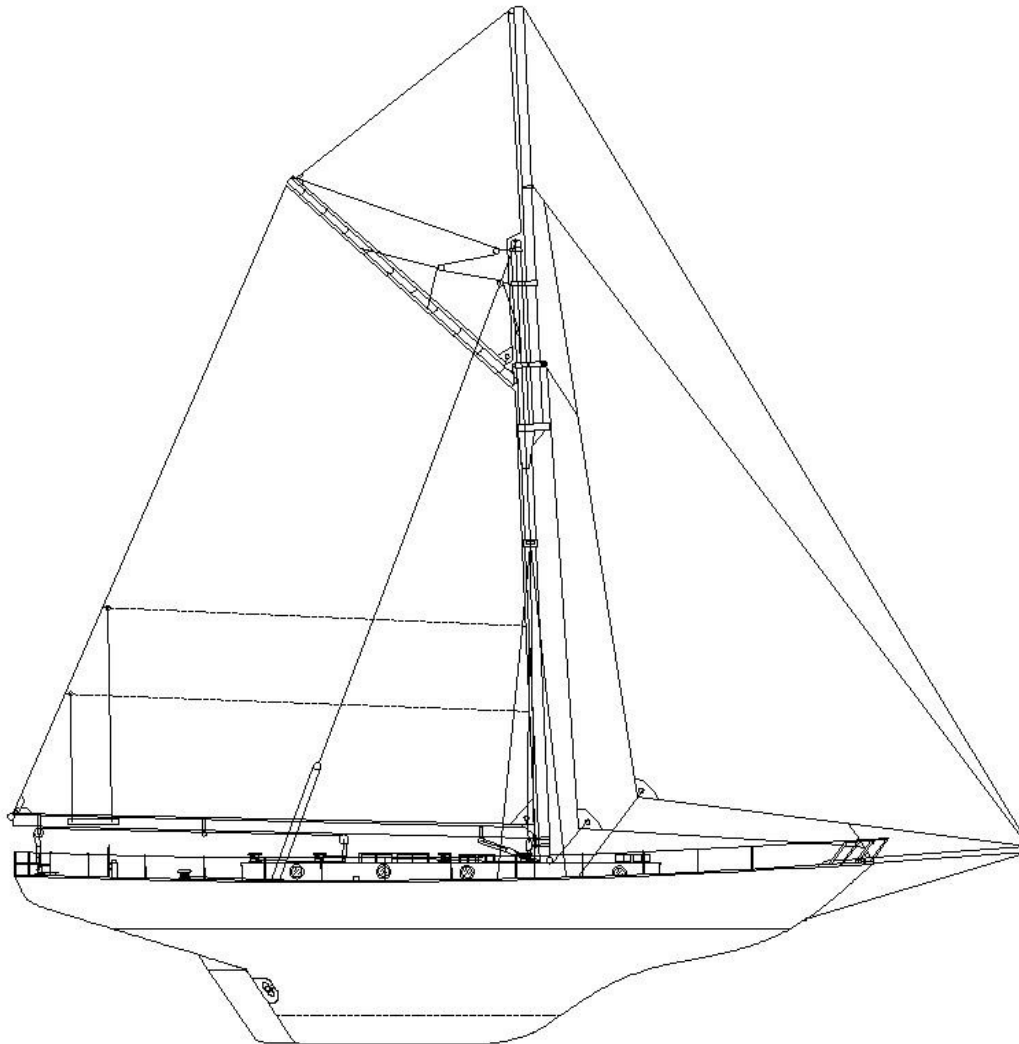


[*Isis* Characteristics]

- Loa – 105 ft.
- Length of hull – 88 ft.
- Lwl – 70.3 ft.
- B – 23.5 ft.
- T – 12 ft.
- D – 18.7 ft
- Displacement – 95.7 LTSW
- Mast height – 95 ft. from the DWL
- Rig type – Gaff rig sloop



[Outboard Profile



ISIS OUTBOARD PROFILE

DESIGN TEAM

L/C WEBER	
L/C JOHNSON	
L/C SAMMARTO	
L/C DOHERTY	
DRAWING: 1 OF 1	DATE: 27 APR 05
REVISION: 6	SCALE:
COMMENTS:	



[Velocity Prediction Program]

- PCSAIL2.5 - Freeware, University of Michigan
- Enter hull particulars and sail characteristics
- Velocity prediction for winds 6, 9, 12, 16, 20 knots
- Wind angles from 38 to 178 degrees (various increments)



Velocity Prediction Progra

PCSAIL2.5, Freeware, U of MI

ENTER BOAT ID

IS THERE A CENTER BOARD ?
IS IT A DAGGER-BOARD ?????

"YES/NO"
No
No

IF BOTH CB & DB THEN ZERO PREVENTS
VPP RUN, ELSE 1, OK
1

IS THE RUDDER SEPARATE ?
NO

NOTE: MUST ENTER RUDDER DIMENSION

Overall Length, Loa
88.89

Beam, B
23.45

water line

FIXED KEEL, ALSO SEE BELOW FOR CENTERBOARD INPUT

root Cord
4

Span
8

Dft
1.5

tip cord
1

Favg
5.2

root cord
41.2

tipcord
20.7

Lb
0

Db
0

water line Length, Lwl
70.29

Tc
5.2

NOCB,NODB
TRUE

Tmaxboard
5.2

waterline Beam, Bwl
21.12

Tmin
12

Tmax
12

TO SAVE OLD DATA EN
AND RE ENTER 1

REVIEW INPUT BY CHECKING THAT NEW DATA IS REALLY NEW IF SO INTENDED, AND THAT DIMENSION-LESS RATIOS ARE "GOOD PRACTICE"

	SAVED	39.25	30.78	10.239	10.89	3.59	5.816	1.789	13.606	9.265	1.85	1.85	3.5	0	0	1.32	
DIMENSIONS		Loa	Lwl	Bwl	B	Favg	Tmaxfix	Tc	ktrcrd	ktprcd	Rudtrcd	Rudtpcrd	Rudspn	Lb	Db	Dft	
NEW		88.89	70.29	21.12	23.45	5.2		12	5.2	41.2	20.7	4	1	8	0	0	1.5

COMPATABILITY OF DIMENSIONS WITH GOOD PRACTICE AND DELFT S, TRUE OR FALSE

	SAVED	1.789	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lwl/Bwl	Bwl/Tc	Lwl/DSPCf*(Lcbfpp/Lwl)	0.52<Cp<0.6	0.6<Cm<0	Favg/Lwl	CREW-Mvbl	?ALLOK?	DIMENSNS	Tmincb	Minsweep	CBcrd	CBspn	DBcrd	DBspn		
TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	NEW	5.2	20	0	0	0	0	0	0

CLEAR INPUT

Command



Velocity Prediction Progra

PCSAIL2.5, Freeware, Univ. of MI.

IF BELOW VALUES ARE ZERO, SAIL AREAS WILL BE LARSSON'S, ELSE ENTERED VALUES

ENTER LARSSON BY BUTTONS OR USER VALUES

A,MAIN	A,JIB	A,SPIN	An
2651.2	1619	0	42770.1

USER SUPPL

AWAngle

2
5
8
10
18

SPIN LEECH	51.7
Spin Leech Dft	51.7

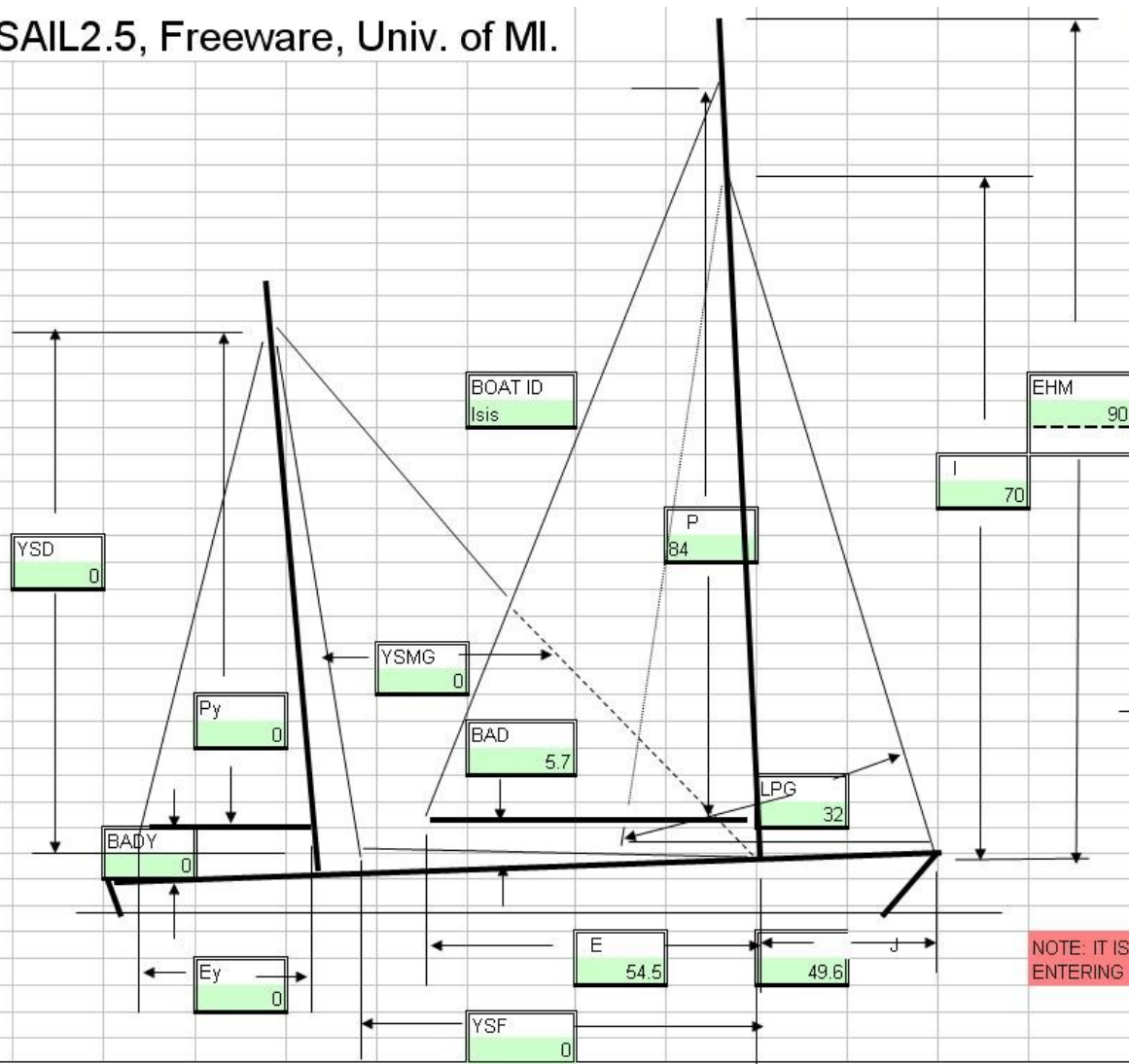
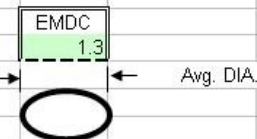
USER SUPPL

AWAngle

2
5
8
10
18

EHM,Default	91.9425
EHM, USED	90.5

EMDC,Default	1.13125
EMDC,USED	1.3

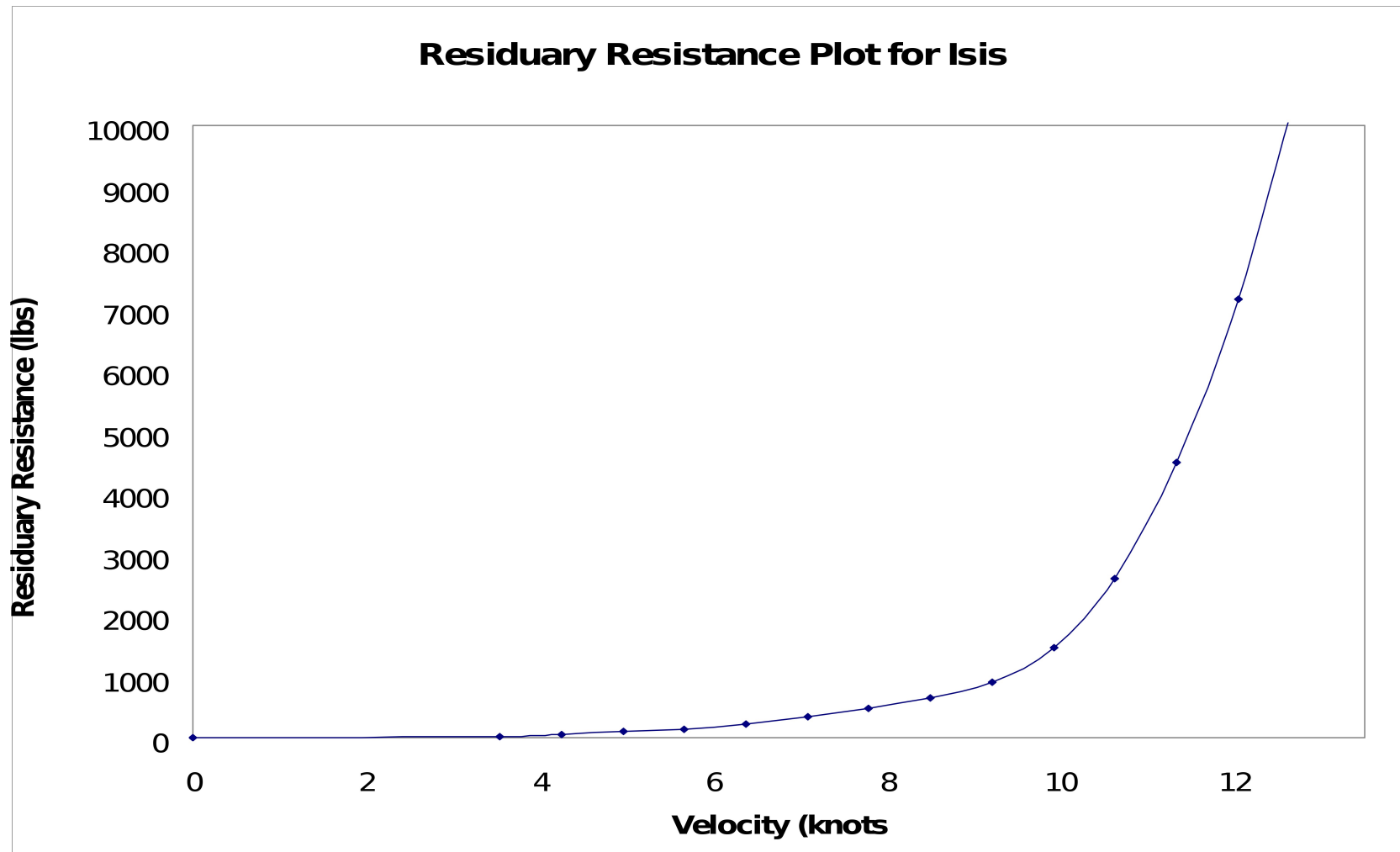


NOTE: IT IS WISE TO CLEAR OLD DATA BEFORE ENTERING NEW BOAT DIMENSIONS

CLEAR INPUT BUTTON

CommandButt

[Velocity Prediction Program]





[Velocity Prediction Progra

Motoring speed – approx. 8.5 knots

Froude = 0.301

R_r = 649.6 lbs (VPP)

R_{prop} = 35.5 lbs (VPP, 18" dia., feathering)

$R_{friction}$ = 928.3 lbs (VPP)

R_{Total} = 1613.4 lbs

EHP = 42.1

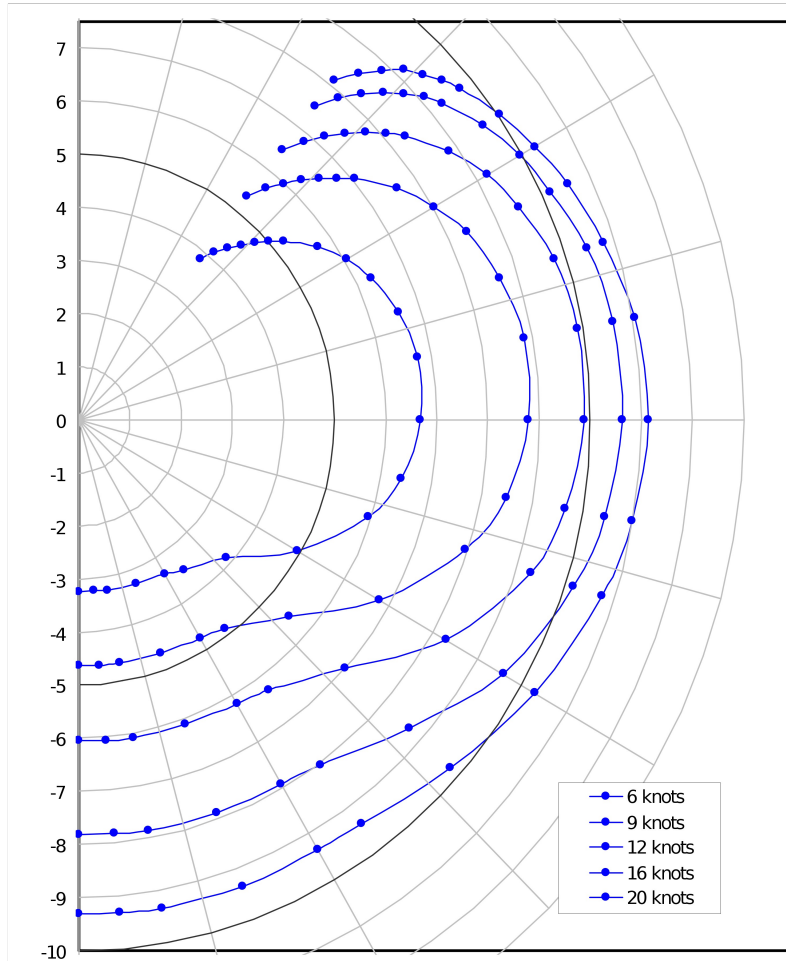


[Velocity Prediction]

For Wind Velocity of 12 knots:

- Velocity upwind (47 deg) = 7.8 knots
- Beam reach (90 deg) = 9.9 knots
- DDW (180 deg) = 6.0 knots

- MAIN SAIL = 2248.2 sq. ft
- TOPSAIL = 403.0 sq. ft
- JIB = 1046.7 sq. ft
- STAYSAIL = 572.3 sq. ft
- TOTAL = 4270.2 sq. ft





Rig Design

SPAR REQUIREMENTS

MAST:

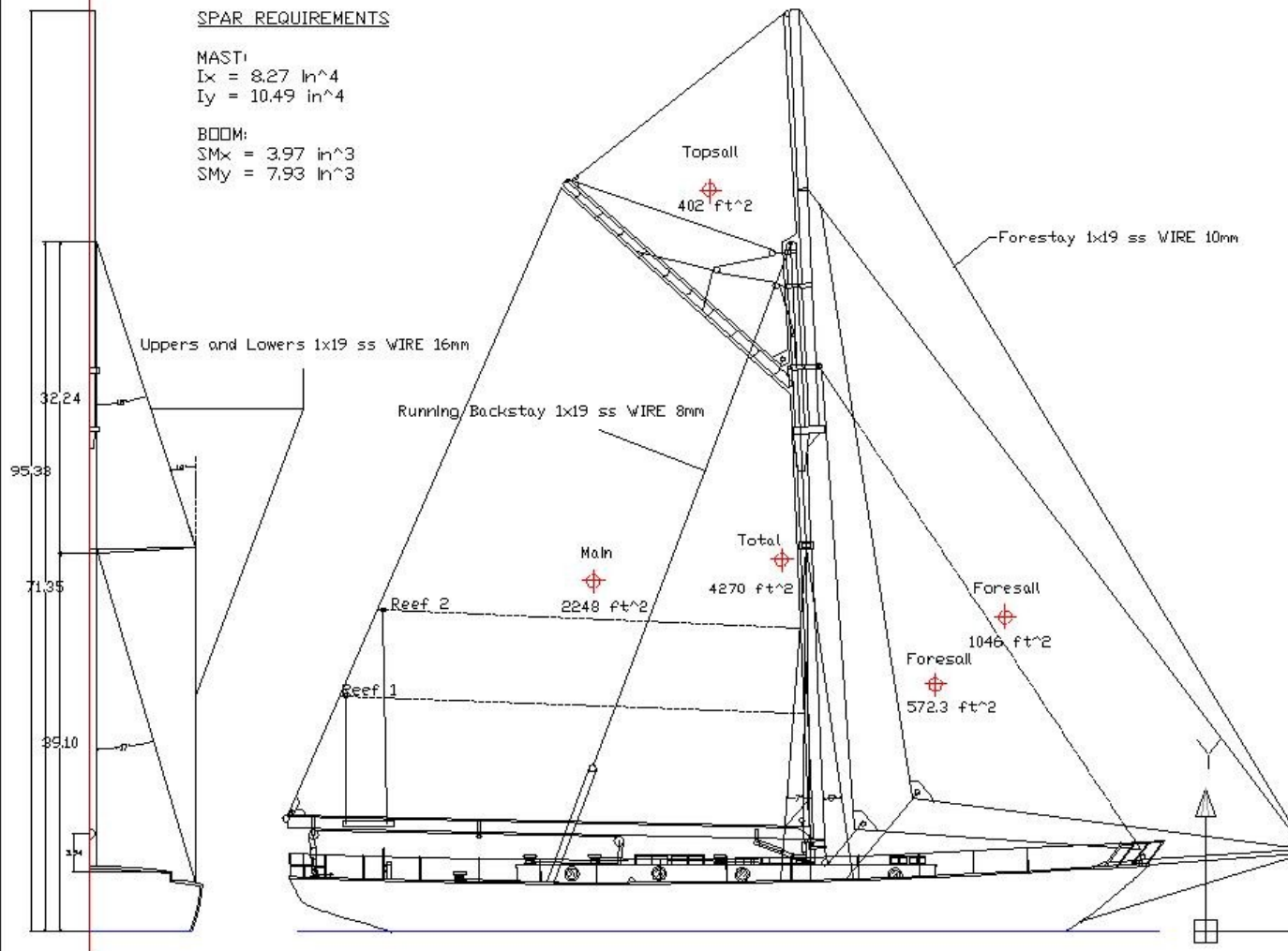
$$I_x = 8.27 \text{ in}^4$$

$$I_y = 10.49 \text{ in}^4$$

BOOM:

$$SM_x = 3.97 \text{ in}^3$$

$$SM_y = 7.93 \text{ in}^3$$



ISIS RIG DESIGN

DESIGN TEAM

1/C WEBER	
1/C JOHNSON	
1/C SAMMARTINO	
1/C DOHERTY	
DRAWING 1 OF 1	DATE: 27 APR 05
REVISION 4	SCALE:

COMMENTS:



[Rig Design]

- Assumptions (Larsson's)
 - 60% mainsail reef
 - no foresail
 - 30 deg. righting moment
- Trade-offs
 - Fewer spreaders to retain classic look
 - Thicker shrouds and stays
- Problems
 - Gaff?
 - Topmast?
- Weird but true
 - Carbon fiber spars (minus bowsprit)
 - Topmast for looks



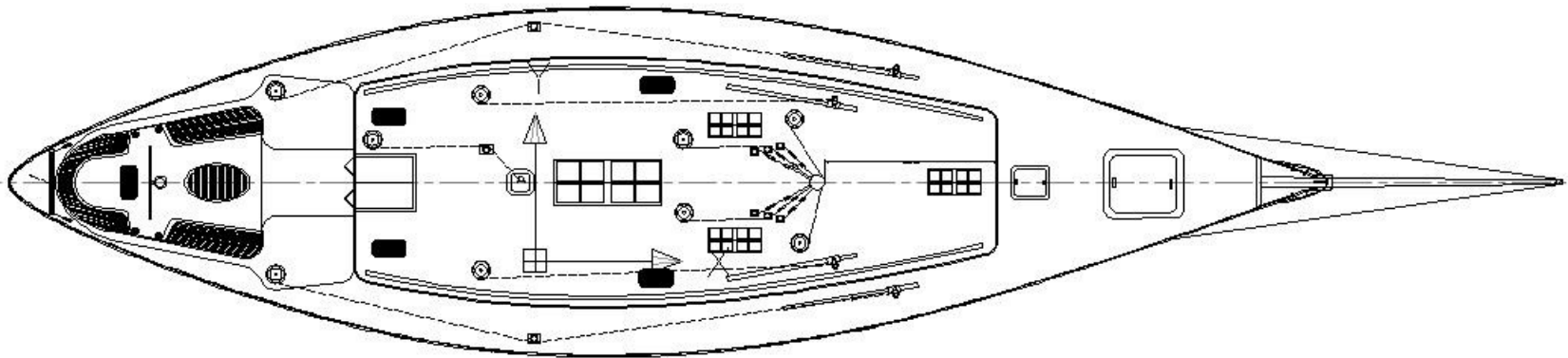
[Rig Design

- Main Mast
 - Diameter = 14 in.
 - Wall Thickness = 0.51 in
- Top Mast
 - Diameter = 10 in.
 - Wall Thickness = 0.34 in
- Gaff
 - Diameter = 8.25 in.
 - Wall Thickness = 0.23 in
- Boom
 - Diameter = 11.5 in
 - Wall Thickness = 0.45 in

Carbon Fiber



[Deck Layout



ISIS DECK LAYOUT

DESIGN TEAM

1/C WEBER
1/C JOHNSON
1/C SAMMATARO
1/C DOHERTY

DRAWING: 1 OF 1

DATE: 27 APR 05

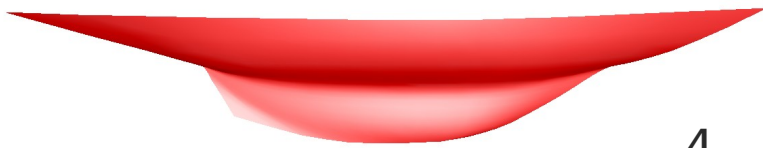
REVISION: 4

SCALE:

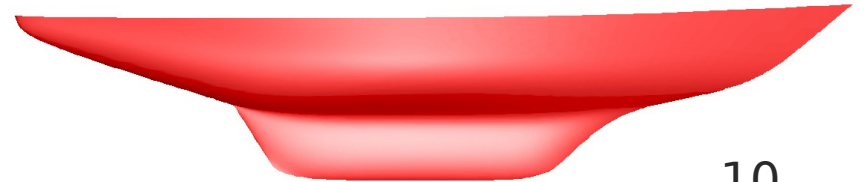
COMMENTS:



[Hull Progression



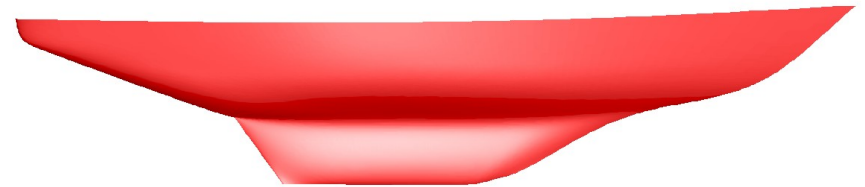
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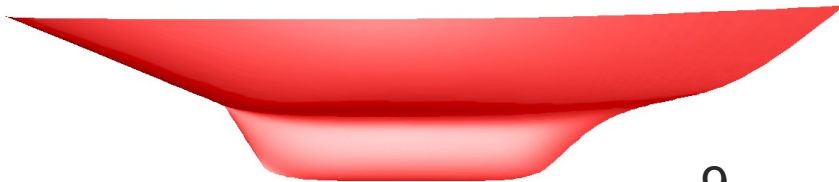
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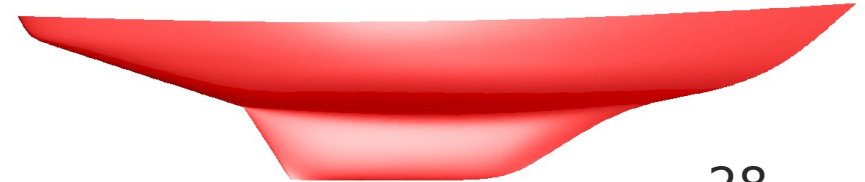
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14



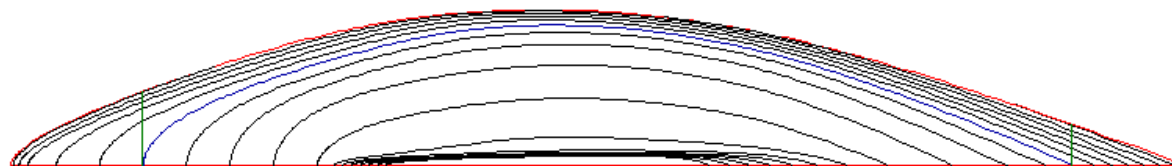
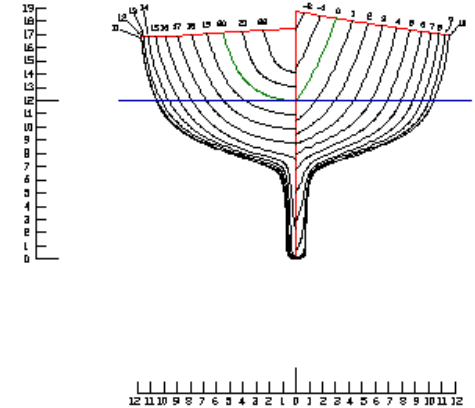
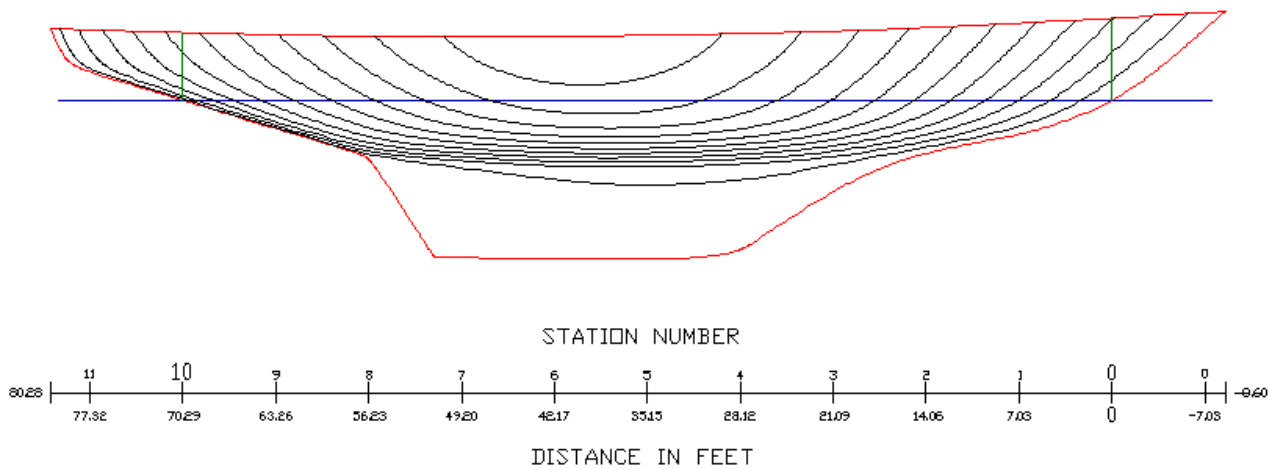
9



28



[Hull Lines - revision 40]



ISIS LINES PLAN	
DESIGN TEAM	
1/C WEBER	
1/C JOHNSON	
1/C SAMMARTINO	
1/C DOHERTY	
DRAWING: 1 OF 1	DATE: 26 APR 05
REVISION: 14	SCALE:
COMMENTS:	



[Foil Design

Isis incorporates a full keel with an attached rudder.

The keel is a NACA 63-007 foil.

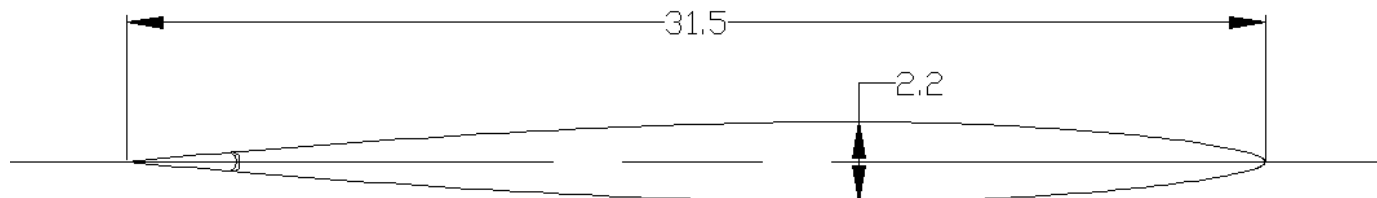
Aspect Ratio: 0.22

Rudder Area: 31 ft²

Sweep Angle: 42 degrees

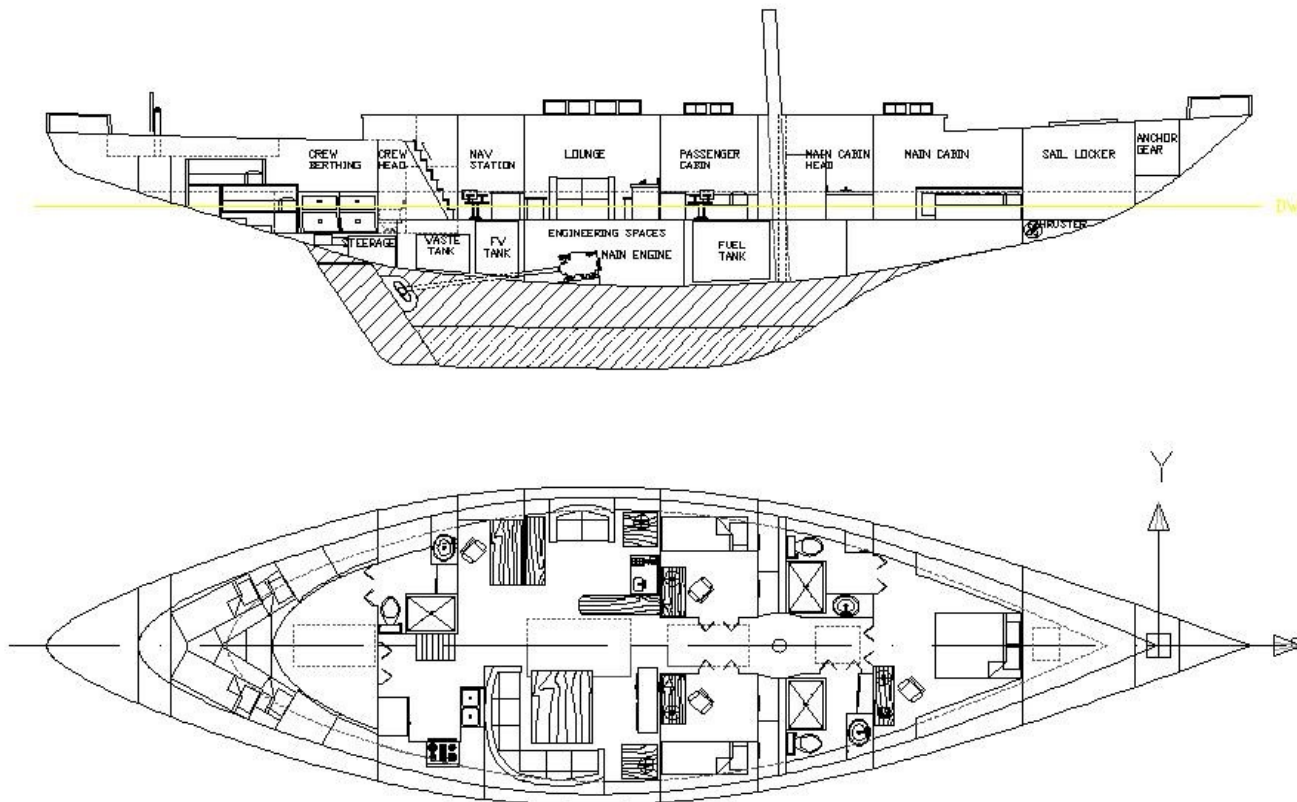
Sail Area/Rudder Area: 0.72

Stall angle: 10 degrees





Accommodations



ISIS GENERAL ARRANGEMENTS

DESIGN TEAM

1/C WEBER	
1/C JOHNSON	
1/C SAMMATARO	
1/C DOHERTY	
DRAWING 1 OF 1	DATE: 26 APR 05
REVISION: 16	SCALE:

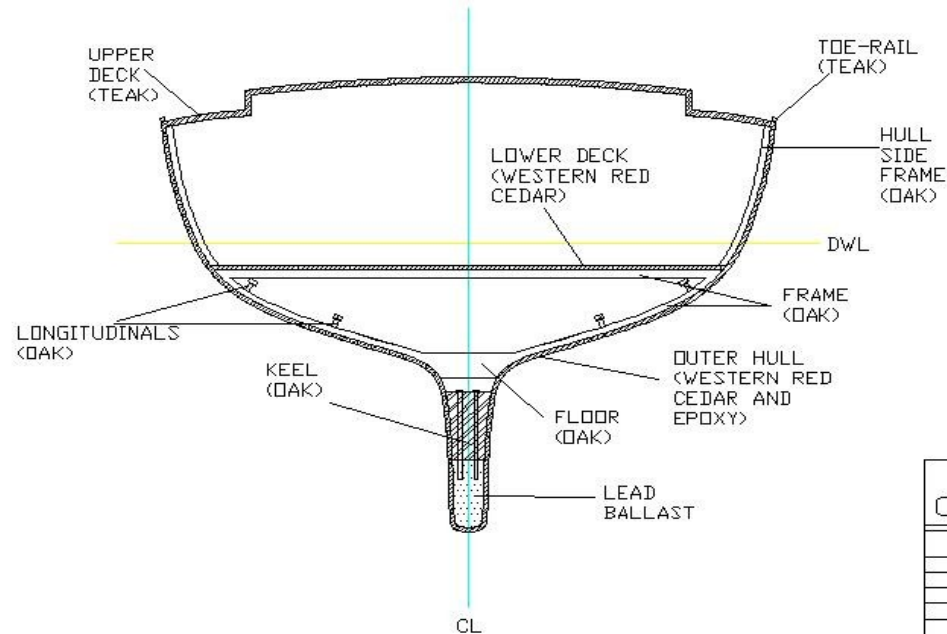
COMMENTS:



[Structures

- Cold Molded Wood and Epoxy Construction
 - Thickness – 0.20 in. (ABS Rules)
 - Width – 4.89 in. (ABS Rules)
- Lead Keel
 - Keel Bolt Diameter – 1.91 in. (ABS Rules)

Midship Construction Section



ISIS MIDSHIP CONSTRUCTION SECTION	
DESIGN TEAM	
1/C WEBER	
1/C JOHNSON	
1/C SAMMATARO	
1/C DOHERTY	
DRAWING: 1 OF 1	DATE: 26 APR 05
REVISION: 8	SCALE:
COMMENTS:	



[Weights and Centers]

Lightship: Displacement – 86.8 LT

VCG – 10.3 ft (+baseline)

Full Load: Displacement – 95.7 LT

VCG – 10.3 ft (+baseline)

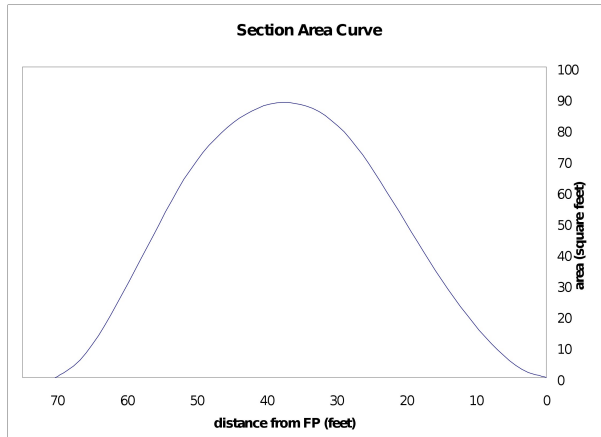
Fuel Capacity – 1400 gallons

Water Capacity – 900 gallons

Burnt Out: Displacement – 87.9 LT

VCG – 10.4 ft (+baseline)

[Hydrostatics



Disp: 95.7 LT
LCB = 37.05 ft

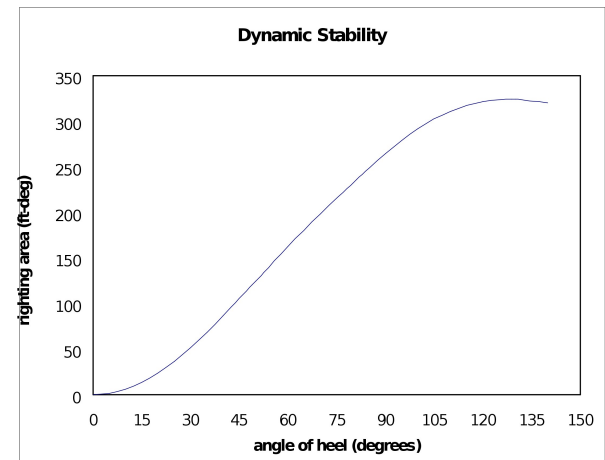
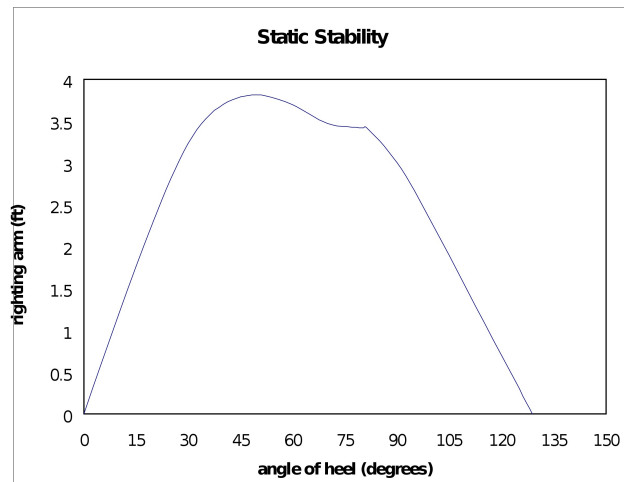
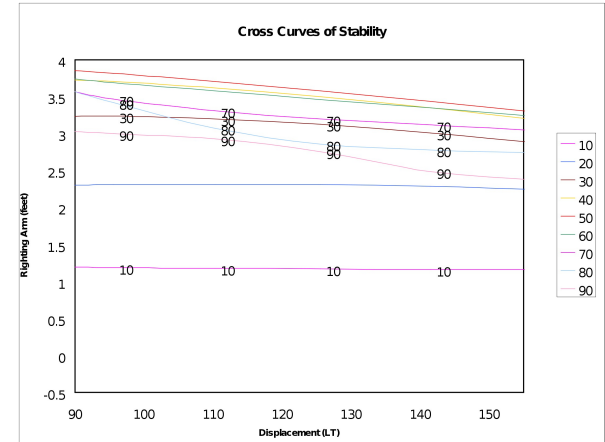
LCF = 37.5 ft

WSA: 1548 ft²

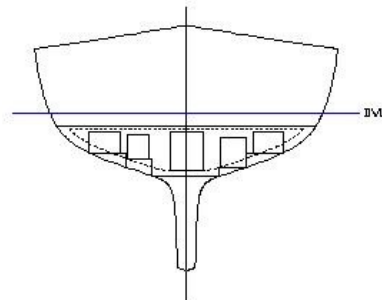
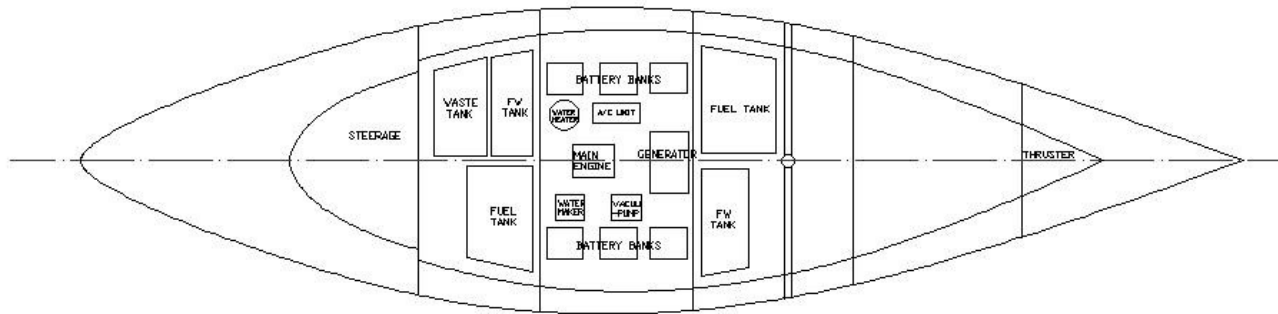
$C_B = 0.40$

$C_P = 0.54$

LPS = 129°



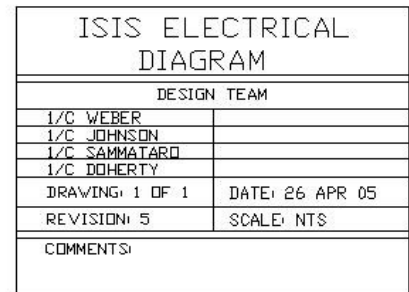
Engineering Diagram



ISIS ENGINEERING ARRANGEMENTS

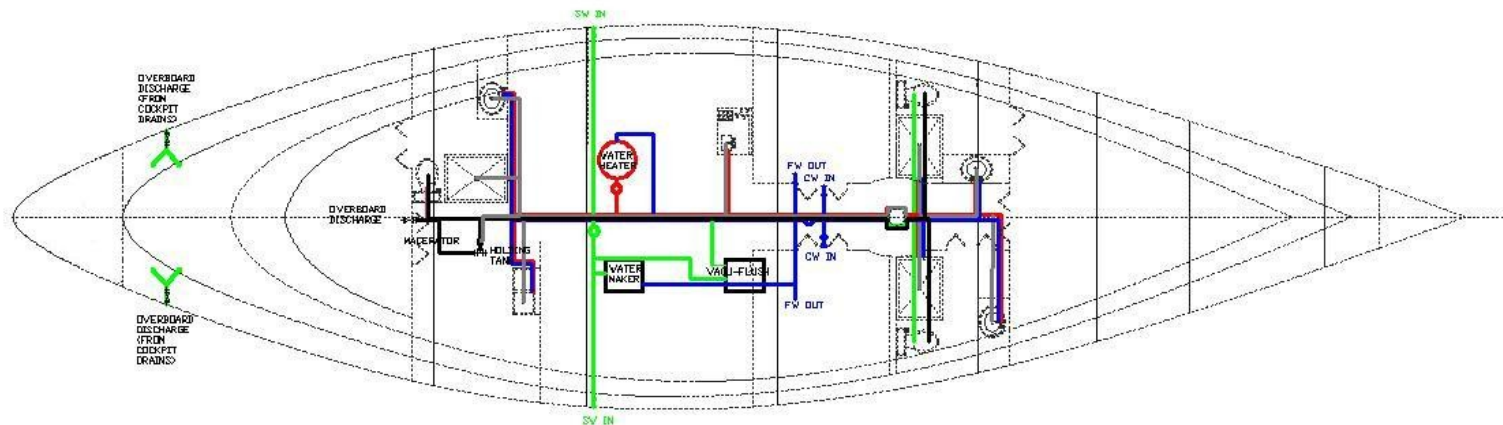
DESIGN TEAM

1/C WEBER	
1/C JOHNSON	
1/C SAMMATARO	
1/C DOHERTY	
DRAWING: 1 OF 1	DATE: 27 APR 05
REVISION: 6	SCALE:
COMMENTS:	





[Piping Diagram



ISIS PIPING DIAGRAM

DESIGN TEAM

1/C WEBER
1/C JOHNSON
1/C SAMMARTINO
1/C DOHERTY

DRAWING: 1 OF 1

DATE: 26 APR 05

REVISION: 2

SCALE:

COMMENTS:



[Powering

Yanmar Type 4JH3-THE Diesel Engine



- 100 hp at shaft
- 3800 RPM at shaft
- 92 hp/3700 RPM continuous rating output



[Powering

Onan 35 kW/60 Hz Diesel Generator

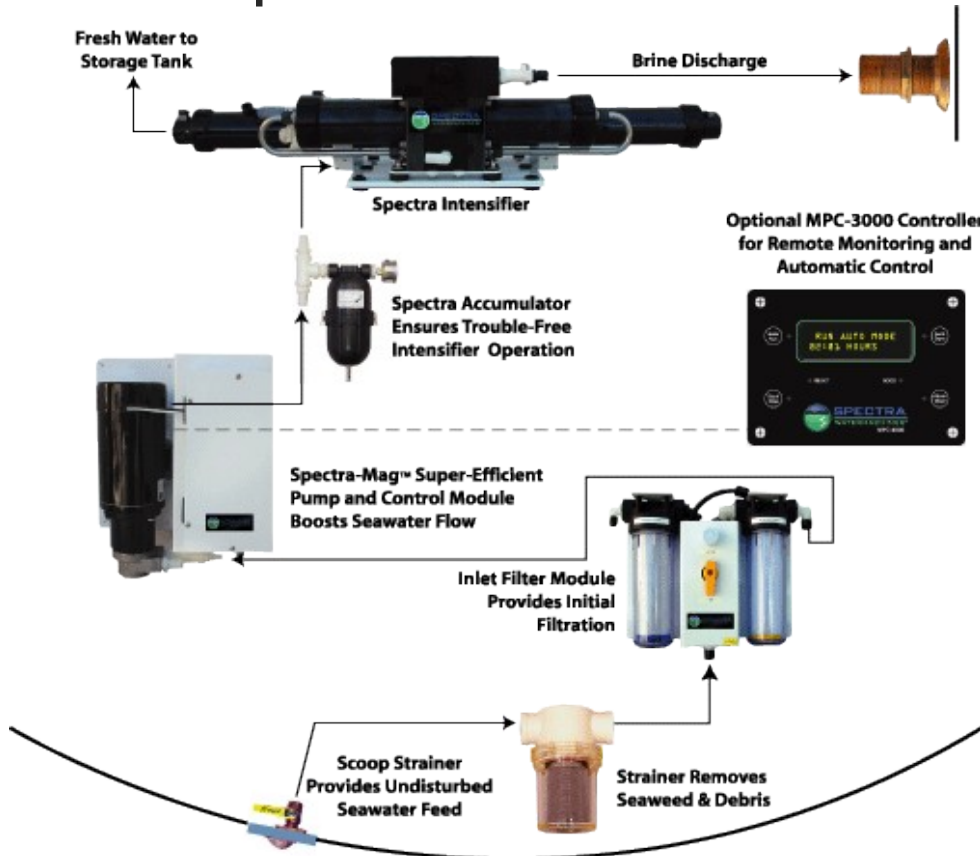


- 35 kW
- 120 V
- 121 A
- 3 Phase
- 60 Hz
- 1800 RPM



[Auxiliary Machinery

Spectra Catalina 300 Water-maker



Water Production:

300 gal/day

12.5 gal/hr



[Auxiliary Machinery

Seaward Products H2850 Water Heater



Capacity: 28 gallons



[Auxiliary Machinery

Marine Air CS 16000 Air Conditioner



Capacity: 16,000
BTU/hr



[Acknowledgements

- The *Isis* Design Team thanks the following people for their time and effort on our behalf:
 - Prof. Miller
 - LT. Almeida
 - Mr. Tom Price

QUESTIONS???

